Address By

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THE NASA SPACE PROGRAM TODAY -- AND TOMORROW

This is the height of the budget season, so I am not going to talk about the budget.

The title of my talk is "The NASA Space Program Today -- and Tomorrow." Not much of a title but your club secretary wanted something and that's what I gave him.

As it turns out, this title is what I want to talk about. John Naugle was your guest last month and covered our space science and applications programs very well. George Low, I understand, will be your guest in January and will bring you up to date on our efforts to carry out the President's policy to encourage greater international cooperation in space endeavors. Earlier this month, at a conference at Langley Research Center, I discussed NASA's desires to do more aeronautical research of direct benefit to civil aviation, to give this country a fighting chance to maintain its leadership in the world aircraft market.

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So the subject for today is: How do we get from today to tomorrow in the space program? The answer, of course, is concentrate on near Earth space and develop the Space Shuttle.

During the past ten years, NASA has concentrated much of its effort on the lunar landing goal and lunar exploration, with great success from every point of view. We will complete the Apollo program with the Apollo 16 and 17 flights to the Moon next year.

Now we are shifting emphasis in our manned space flight effort from the Moon to Earth orbit, first in Skylab and then in the Space Shuttle, which will serve both manned and unmanned missions.

When Apollo ends, most of our space activities planned for this decade will be in Earth orbit -- and Moon exploration, for a time, will be left completely to the Soviets.

Emphasis will also be on the Earth itself, as seen from space or as served from space; even though we will also have important manned and unmanned instruments trained on the Sun and the universe from Earth orbit.

In a way, our continuing effort to explore the planets is also closely related to Earth studies. No one can predict all that we are going to learn from the planets, but I am sure that much of what we learn will have direct and valuable appliation to our understanding of Earth and our current concern with environmental protection.

The Apollo astronauts gave Earth men their first view of the world as a lonely planet in a great void, as a God-given natural spaceship with limited supplies of air, water, soil and other resources essential for life and comfort. The Apollo pictures of planet Earth helped create the present widespread concern for the world's environment. I am glad to say that NASA is now well prepared to take a leading role in defining and responding to this concern.

I have been a strong believer in the Apollo program for many years. I welcome this "return to Earth" emphasis in our programs as proper, at this time. Much of the Apollo technology and equipment will be used directly in Skylab and directly or indirectly in the Space Shuttle. Moreover, we gained invaluable experience in Earth orbital operations in the Gemini program and on the way to the Moon and back. We are well prepared for the next logical steps in near-Earth space.

I wish very much we could continue lunar exploration programs after Apollo 17, but if we have to make hard choices in this decade, then the right choice is to return to Earth orbit and defer lunar exploration.

We do hope to keep open the option of flying additional Apollo missions in Earth orbit. This would enable us to carry out additional experiments in our Earth resources program, and would also facilitate our planning for cooperative flights with the Soviet Union.

It would be a serious mistake to interpret our return to Earth orbit as an excuse to rest on our laurels, or to rely on out-dated technology. The return to Earth orbit makes sense only if we make a concerted effort to bring the Space Shuttle into use by the end of the decade.

I predict a great increase in worldwide demand for applications satellites during this decade. But this demand can be met only if we make applications satellites cheaper to <u>design</u>, <u>build</u>, <u>launch</u>, and <u>maintain</u>. To do this we must have the Space Shuttle.

So this is my message to all public and private agencies who look to NASA for help in using space: The key to our ability to help our country and to serve mankind is now the Shuttle. The sooner we build it, the better we can serve.

I hope to see this decade enter the history books as a decade of space technology development, so that the Eighties and the Nineties can become a Golden Age of space use.

In this decade of development, Skylab will be our first experimental space station. Three crews of three men each will use this extraterrestrial base in 1973 to demonstrate that men can live and work effectively in space for long periods of time, up to 56 days. More to the point, Skylab should also demonstrate that there is important work to be done in space that only men can do. Major experiments related to astronomy and earth resources will be performed over a nine-month period.

Skylab will show why near-Earth space is a new frontier where men belong. The Space Shuttle will make it cost effective to get them to similar labs, more permanent in nature, on a more routine basis.

I have been talking about work in space for men -- that only men can do. Of course, I mean both men and women, because the Space Shuttle will make it quite feasible for men and women to work together in space as scientists and engineers, or at any of the new occupations that life in orbit may bring into being.

It might be useful to emphasize my strong support for the Space Shuttle by telling you briefly how the Shuttle looks to me today, not as an engineer's blueprint, but as a comcept.

The Space Shuttle, as I see it, will do many things, play many roles.

It will be our most important program to develop new technology for space use in this decade. It will bridge the gap between aeronautics and astronautics, providing valuable new technology to aviation as well as space flight.

It will be our first re-usable launch vehicle, and for that matter our first re-usable space vehicle.

It will provide easy access to space -- easy on the passenger, easy on the tax payer.

It will broaden the scope of space operations in a giant step forward comparable to Neil Armstrong's first step upon the Moon.

Its crew, aided by scientists and engineers, will be able to deploy spacecraft in orbit, repair them, re-supply them with film or fuel or whatever they need, or bring them back to Earth for refurbishment and re-use.

It will be, I imagine, the most versatile vehicle Man has conceived since he invented the wheel. Its payloads will be both men and machines. It will launch weather satellites, communications satellites, Earth observation satellites, and scientific satellites of all kinds.

It will itself be an orbital laboratory manned by scientists and engineers for missions lasting a week or more. It will be, from mission to mission, an astronomical observatory, an Earth observatory, an industrial workshop, a satellite repair shop, or a space resuce ship.

The Space Shuttle will be available for military as well as civilian uses.

In its large cargo bay, it will be able to carry upper stage rockets (such as Agena or Centaur or the still-to-be- developed Space Tug) and thus can help put payloads into synchronous orbit or send them on out to the planets.

The Space Shuttle will serve many of the same purposes a permanent space station would. And it will be able to carry into orbit the building blocks from which space stations of the future can be constructed; and when these space stations are built, the Shuttle will live up to its name and ply back and forth from Earth to orbit with personnel and supplies.

It is easy to see how a re-usable Shuttle will reduce the cost of launching payloads. But it is not so widely understood that the Shuttle will make possible even greater savings in the designing and building of payloads.

Spacecraft taken into orbit by the Shuttle will not need to be so compactly built or so ruggedly built as today's satellites and can use many "off the shelf" components. This means that when the Shuttle becomes available new space experiments can be conceived and made ready for flight in six months time instead of six years or more.

I am always depressed when I think of a team of gifted scientists and engineers working for five or six years on a space experiment and then standing by helplessly when it fails because of some minor malfunction. Because of its inherent reliability, the Shuttle will change this.

Because of these savings in launch costs, payload costs, and payload development time, the Shuttle will greatly expand presently identified uses of space and lead to the invention of many new ones. I believe the Shuttle will do more than any other program we could conceive at this time to bring the benefits of space use rapidly to all mankind.

The Shuttle will also do more than any other program we have underway or planned to help us maintain the space leadership we achieved with a decade of great effort in the Apollo program.

The Shuttle will represent us well in space competition, and at the same time promote space cooperation. Because it will perform services many nations will want, and will be able to afford, the Shuttle will help pay for itself by improving our balance of trade.

The Shuttle calls for a long-range investment of major proportions, with pay-offs delayed for seven years or more. But these payoffs, once begun, will continue for many years, and the Space Shuttle, I predict, will be one of the most rewarding long-lasting investments this nation or any other has ever made.

With the Shuttle, the United States will share in the responsibilities and the rewards for opening up the realm of orbital space to the manifold uses of man. Without the Shuttle, we will be handing over a monopoly on these responsibilities and rewards, and on vast opportunities as yet unperceived, to the other pioneering nation in space, the Soviet Union.

Fortunately, we still have some measure of control over our national destiny, on Earth and in space. I feel confident that we will choose the Shuttle as a worthy follow-on to Apollo and a prudent investment in making the future more like we want it to be.

Yes, I foresee great things for the Shuttle. Now all we have to do is get it off the ground -- or out of the planning stage and into serious development so that the first orbital missions can be flown by 1978.

Two different kinds of decisions are needed. NASA needs to complete the technical definition of the Shuttle (taking into account present day fiscal realities) and then we need the approval of the President before final commitment to development.

In my first speech as NASA Administrator I said we would take as much time as we needed to be sure we made the right decisions on the Shuttle. Too much was at stake for NASA, the Air Force, the aerospace industry, and the whole country not to do so.

I noted in this speech, that the funds requested for Fiscal Year 1972 could go either for starting Shuttle development or for further design work should it turn out that further design work was needed.

I expressed the hope that the proper course would become clear by early summer, so that we could move out with a request for proposals by the end of the summer.

Now what has happened in the six months since I made those remarks? There has been both progress and problems.

First, the progress: The definition studies of a fully re-usable Shuttle system requiring minimum refurbishment -- what we call the baseline Shuttle -- were completed in June 1971. These studies showed that such a system is well within the available technology and that it would have very low operational costs.

But there was a problem, too. The size and technical sophistication of this system project high development costs and a high degree of technical risk.

By technical risk I do not mean the possibility of catastrophic failure or even the risk of not being able to do what we set out to do. I do mean that we recognized a high degree of risk of running into technical difficulties which would delay the program and/or increase its costs significantly.

Moreover, development of this sophisticated, fully re-usable baseline system would involve annual funding requirement of almost two billion dollars in the mid-Seventies.

The baseline Shuttle remains our preferred approach, but the question is: Can we get the necessary support to carry the baseline concept through a successful development effort and do all the other things we want to do and need to do within our balanced, versatile NASA program?

Accordingly, we have been studying for the past several months a number of options to the baseline Shuttle under which the peak funding, the near-term funding, and the technical risk would all be substantially lower. These reductions would be achieved, however, at the expense of increased operating costs.

Under these various options, technical risks would be reduced by phasing subsystems in the orbiter and by utilizing simpler booster concepts.

According to our present thinking, under each of these various options, we would develop the orbiter and possibly the booster in two phases.

The Mark I orbiter would be flown in orbit in 1978, and the Mark II orbiter in the early 1980s. Development of the first booster would be completed in time to fly the Mark I orbiter.

The combined effect of these modifications in original baseline concept would reduce peak annual funding requirements from almost two billion to about one billion.

Before choosing one of these alternate concepts, we clearly had to have information comparable to that obtained from the Phase B definition of the fully re-usable baseline Shuttle.

Thus, we found it necessary to do what I indicated last May might happen. The studies were extended for four months beginning July 1 and then extended again for up to six months beginning November 1.

I would like to stress that the purpose of our present studies is to enable us to define the best possible alternative to the baseline Shuttle which would reduce development costs in the mid-Seventies and involve less technical risk. When these studies are completed, we can make valid comparisons of the advantages and disadvantages of the baseline Shuttle and the best alternative to it.

These comparisons will give NASA and the President a much sounder basis for a final decision on the Shuttle approach than we have had so far.

As the result of these studies to date, our thinking is now reasonably firm on the orbiter. It will have an external, expendable tank carrying both hydrogen and oxygen. The main orbiter engine will initially be either an improved version of the J2 engine used in upper stages of the Saturn 5 (called the J2S), or a new high pressure engine; if the improved J2 is chosen initially we may or may not phase to a high pressure engine later on. For the heat loads, we will have an ablative system in Mark I and re-usable thermal protection in Mark II. For avionics, we will make modest advances in the state of the art for Mark I and more substantial advances for Mark II.

For the booster, four major concepts are still under study:

One concept would use the F-1 engines developed and proven in the first stage of the Saturn 5. This booster would be manned and would fly back to the launch site.

The second and third concepts would be unmanned and would be recovered from the ocean after a parachute landing.

The second concept would be a single pressure-fed booster which would require development of a new engine.

The third concept would use twin pressure-fed boosters firing simultaneously with the orbiter. Development of a new engine would be required.

The fourth booster concept would be twin solid rockets firing with the orbiter. This booster would be unmanned and would not be recovered from the ocean.

I would like to stress here that we expect the Shuttle with the Mark II orbiter to meet the same high performance requirements as the fully re-usable, more sophisticated baseline Shuttle we were talking about earlier this year.

These requirements include a 65,000-pound payload in due east orbit; a payload bay 15 feet in diameter and 60 feet long; a quick turnaround of several weeks; a cross-range capability of 1,100 miles as specified by the Air Force; and a reaction time of 24-48 hours.

The major difference between the Mark II orbiter and the orbiter under the baseline concept is the use of an external expendable tank for the oxygen and hydrogen fuel.

The Shuttle with the Mark I orbiter would have a somewhat smaller payload capacity; possibly a reduced cross-range capability; and a turnaround time measured in months, perhaps, instead of weeks. The size of the payload bay, however, would be the same.

These lower performance characteristics of the Phase I orbiter would not be too significant because they would prevail only during the period from 1978 until the Mark II is available in the early Eighties. And during this period emphasis would be more on learning how to use the Shuttle than on routine operations.

When studies are concluded under the present extension, which might run to April 30, we will be ready to release our request for proposals by industry on Phase C and D design and development of the Space Shuttle. I hope we will be ready to release our RFP before April 30. If the final phases of our studies progress as rapidly as now seems likely, we could be in a position to release our RFP as early as February or March -- providing, of course, that we have by then the necessary green light. We already have an authorization from Congress to begin Shuttle development in the current fiscal year.

I recognize very well that our partners in industry want this study period to end as soon as possible. So do we.

Today's major programs, which include Apollo and Skylab, Mariner and Viking, the Earth Resources Technology Satellite, and the High Energy Astronomical Observatory, are exciting and rewarding. When we get the Space Shuttle and the Outer Planets program over the hump and into serious development we will have the assurance of challenging and rewarding programs for tomorrow.

I thank you.

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